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EXAMINER	
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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/476,961
Filing Date: January 03, 2000
Appellant(s): YU, BIN

Jean M. Tibbetts
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed January 27, 2004.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

Appellant's brief includes a statement that claims 18, 21-25, and 28-37 do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,677,224	Kadosh et al.	10-1997
5,625,216	Miller	4-1997

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 18, 21-25, and 28-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadosh et al. (US 5,677,224) in view of Miller (US 5,625,216).

Kadosh et al shows (fig. 1U) a semiconductor device including a plurality of field effect transistors, each transistor comprising a gate (130) over a channel and a deep source (206) and drain (198) region doped with dopants of a first conductivity type (P). Source (204) and drain (152) extension regions are integral with the deep source and drain regions respectively. The source extension is more heavily doped (P+) than the drain extension (P-). Kadosh discloses that the source extension is deeper than the drain extension such that the device has a low source-drain series resistance and reduced hot carrier effects but does not disclose the drain extension being deeper than the source extension. Miller shows (fig. 6) a semiconductor device having a deep drain region (27) and a source region 29). The device includes source extension (underdiffusion region U_s) and a drain extension (underdiffusion region U_d) integral with the source and deep drain regions respectively. The drain extension is more than 80nm deep (col. 3, lines 15-19). The deeper drain extension provides an increased gate-drain capacitance (col. 3, lines 57-62) or vice versa (col. 4, lines 39-42). With respect to the limitations of the claims concerning the concentration of the dopants, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the dopants at a specific depth and concentration, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the asymmetrical source/drain configuration of Kadosh by forming a drain extension

deeper than a source extension as taught by Miller to increase the gate-drain capacitance.

With respect to the limitations concerning the formation of the device in claims 21-35, a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, **190 USPQ 15 at 17**(footnote 3). See also in re Brown, **173 USPQ 685**: In re Luck, **177 USPQ 523**; In re Fessmann, **180 USPQ 324**: In re Avery, **186 USPQ 116** in re Wertheim, **191 USPQ 90** (**209 USPQ 254** does not deal with this issue); and In re Marosi et al, **218 USPQ 289** final product per se which must be determined in a "product by, all of" claim, and not the patentability of the process, and that an old or obvious product, whether claimed in "product by process" claims or not. Note that Applicant has the burden of proof in such cases, as the above case law makes clear. "Even though product-by- process claims are limited by and defined by the process, determination of patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process." In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985)(citations omitted).

(11) Response to Argument

The appellants primarily argue that Kadosh in view of Miller does not teach that a drain extension is deeper than a source extension or that (3) the combination discloses the unique concentration recited in claim 36. The argument is on the basis that (1)

Miller does not disclose a source/drain extension and that (2) Kadosh teaches away from the feature of a drain extension deeper than a source extension.

(1) With respect to the argument that Miller does not cure the deficiencies of Kadosh by teaching the use of source and drain extensions, the examiner believes that Miller cures the deficiencies of Kadosh and that the combined references teach all of the elements of the claims. In the rejection above, Kadosh showed all of the elements of the claims including a source extension being deeper than a drain extension to lower the source-drain resistance and reduce hot carrier effects in the channel region. Kadosh only lacked the teaching of the opposite scenario in which a drain extension is deeper than the source extension. As stated in previous arguments throughout prosecution, it is well known in the art that sources and drains are structurally the same. They only differ in how one of ordinary skill would bias them. In figure 1N of Kadosh, if a positive voltage were applied to the left side diffusion region 186 and a negative voltage were applied to the right side diffusion region 188, and the device was forward biased, left side diffusion region 186 would be designated as the source and right side diffusion region 188 would be the drain. If the opposite scenario was applied in which a negative voltage were applied to the left side diffusion region 186 and a positive voltage were applied to the right side diffusion region 188, and the device was forward biased, the left side diffusion region 186 would be designated as the drain and the right side diffusion region 188 would be the source. Although this is well known in the art, Miller was cited to explicitly teach such a concept. As stated in the rejection, Miller was cited to show that a drain extension is deeper than a source extension. In figure 6 of Miller, the

source and drain regions are label as 29 and 27 respectively and the source and drain extension portions under the gate of Miller (the portions labeled U_s and U_d) are called underdiffusion regions (functioning as source and drain extensions). The appellant defines (Appeal Brief page 8, first full paragraph) that:

> the source extension 23 and drain extension 25 are thinner than the deep source 22 and deep drain 24 regions and are exposed partially underneath a gate oxide 34 (See Figure 1, Specification, page 5, lines 18-21 and page 5, line 30 to page 6, line 7). Accordingly, a source extension and drain extension are regions of the source and drain that have a different depth that the deep source region 22 and deep drain region 24. (See, Figure 1, Specification, page 5, line 18 to page 6, line 1)

The appellant therefore defines the source and drain extension as being thinner than the deep source and drain. However, the claims themselves do not disclose what the thickness of the source and drain region. For instance, claim 18 only states

> "a source extension integral the deep source region;
> and a drain extension integral the deep drain region, wherein the drain extension is deep than the source extension."

As seen in figure 6 of Miller, the drain extension/underdiffusion portion U_d is integral with the drain region 27 and deeper than the source extension/underdiffusion portion U_s, which is also integral with the source region 29. Furthermore, Miller was not cited to show if the extensions were thinner than the source and drain, Kadosh already disclosed that element. Miller was cited to show that the drain extension could be deeper than the source extension. Miller further teaches that the asymmetrical configuration can be applied in reverse so that the source extension/underdiffusion is deeper than the drain underdiffusion (col. 4, lines 35-45), thus, the invention is also directly applicable to Kadosh, who only discloses the deeper source extension.

Furthermore, the gate length and asymmetrical underdiffusions of Miller improve the breakdown voltage characteristics of the silicon (col. 3, lines 57-67) therefore limiting the effects of the short channel or "hot carrier" effects (just as the appellant's invention does). In essence, Kadosh and Miller show all of the elements of the claims including the drain extension being deeper than the source extension and Miller shows motivation for the combination of the references.

(2) With respect to the argument that Kadosh teaches away from the drain extension being deeper than the source extension, the examiner believes that this assertion is false. The appellant only cites that Kadosh teaches "precisely" the opposite structure in which the source extension is deeper than the drain extension. Just because Kadosh does not disclose a deeper drain extension does not specifically mean that Kadosh teaches away from the deeper drain extension. Kadosh merely neglects to disclose that limitation, and "neglecting to disclose" does not mean "teaching away." Kadosh would only teach away from the limitation if it was stated that it was not desirable to form a deeper drain extension. No statement teaching away from the deeper drain could be found in Kadosh.

(3) With respect to the arguments for claim 36 pertaining to the specific concentrations of dopants in the various regions and extensions, the examiner agrees with the arguments. Claim 36 should be objected to for the same reasons as claims 25 and 26.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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